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Effect of Fungicides and Plant Populations on Soybean Disease and Yield

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Abstract
Fungicides on soybeans provide growers an effective management strategy for foliar diseases, especially soybean rust. However, many questions about fungicides and how common practices affect fungicide efficacy are still unresolved. One possible cultural practice that may affect fungicide efficacy is plant population. Higher plant populations may provide a more conducive microenvironment for certain plant diseases and may reduce the penetration of fungicides to the lower canopy. The objective of these studies was to evaluate the efficacy of fungicides in different soybean plant populations.

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Effect of Fungicides and Plant Populations on Soybean Disease and Yield

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Introduction

Fungicides on soybeans provide growers an effective management strategy for foliar diseases, especially soybean rust. However, many questions about fungicides and how common practices affect fungicide efficacy are still unresolved. One possible cultural practice that may affect fungicide efficacy is plant population. Higher plant populations may provide a more conducive microenvironment for certain plant diseases and may reduce the penetration of fungicides to the lower canopy. The objective of these studies was to evaluate the efficacy of fungicides in different soybean plant populations.

Materials and Methods

Two separate studies were completed. On May 17, NKS S24-J1 RR was planted at four populations (Table 1). Headline® (pyraclostrobin, BASF) was applied to half the plots on August 4 when soybeans were at growth stage R3 (beginning pod). All other plots were the non-treated controls. There were three replications of each plant population and fungicide treatment combinations.

In a second study, NK Brand 21-N6 RR was planted on May 18 at three populations (Table 2). Headline® and Quadris® (azoxystrobin, Syngenta) each were applied to a third of the plots on August 6 when soybeans were at growth stage R3 (beginning pod). All other plots were the non-treated controls. Half of the plots that received fungicide also received insecticide (Mustang Max™). There were three replications of each plant population and fungicide treatment combinations.

Disease was assessed in both studies on September 3 by estimating the percentage of blighted (0–100 percent) leaf tissue on 10 leaves in the lower canopy and 10 leaves in the upper canopy from each plot. Diseases observed were Septoria brown spot in the lower canopy and Cercospora leaf blight, frogeye leaf spot, and downy mildew in the upper canopy.

In the fall, final plant population was determined, soybeans were harvested, and yields were calculated.

Results and Discussion

In the first study (Headline® applied on soybeans planted at four different plant populations), there were very low levels of disease except for Septoria brown spot in the higher plant populations and that received no fungicides (Table 1).

Final populations ranged from 83 to 91 percent of the initial population and were not influenced by the fungicide application.

The lowest plant population did yield less than the other three populations, but none of the differences between the treated and non-treated plots for both yield and moisture were statistically significant.

Overall, fungicides lowered Septoria brown spot severity in the higher populations plots. However, this did not result in a difference in yield.

In the second study where fungicides and insecticides were evaluated on three different plant populations, there was more disease pressure, especially in the lower canopy (Table 2).

Averaged across all three plant populations, the non-treated plots had an average of 8.5 percent brown spot severity. Plots treated with Headline® and Quadris® had an average 2.4 and 4.6 percent severity, respectively. There were no differences between fungicides and the non-treated control for disease in the upper canopy (all less than one percent severity). The yield was 55.0 bushels/acre for the non-treated control, 56.6 bushels/acre for the Headline® treated plots and 56.8 bushels/acre for the Quadris® treated plots.

When averaged across all fungicide and insecticide treatments, there were no differences in disease severity in the lower and upper canopies. Populations at 80,000 plants had slightly less yield (54.9 bushels/acre) compared with 155,000 (56.2 bushels/acre) and 225,000 (57.4 bushels/acre).

When Mustang Max™ was added to the fungicide applications, again there was no significant difference in disease severity. Yield responses were 55.0 bushels/acre for the non-treated, 56.7 bushels/acre for the fungicide treated (Headline® or Quadris®), and 59.3 bushels/acre for the fungicide + Mustang Max™. This yield increase was expected because of soybean aphid pressure in the field that developed in late August.

Overall, fungicides did result in a slight increase in yield and a reduction in Septoria brown spot severity in the lower canopy.

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Table 1. Effect of fungicide and plant populations on soybean diseases and yield.

Treatment	Initial population	Final population	Brown spot[a]	Total disease upper canopy[b]	Yield (bu/A)	Moisture (%)
Headline	80,000	72,600	3.7	0.4	58.7	12.0
Headline	128,000	115,434	2.9	0.9	61.6	11.9
Headline	175,000	149,556	3.1	0.3	61.5	12.0
Headline	225,000	190,212	3.8	0.3	61.4	11.9
Average for Headline-treated plots			3.4	0.5	60.8	11.9
None	80,000	71,148	2.9	0.5	59.2	12.0
None	128,000	113,256	2.7	0.4	61.3	12.0
None	175,000	145,200	5.2	0.8	62.0	11.9
None	225,000	189,486	6.2	0.5	62.5	11.9
Average for Headline-treated plots			4.3	0.6	61.2	12.0

[a]Disease was assessed on 10 leaves in the lower canopy.
[b]Disease was assessed on 10 leaves in the upper canopy. Diseases observed in the upper canopy included Cercospora leaf blight, frogeye leaf spot and downy mildew.
No statistical differences between the treated and non-treated equivalent.

Table 2. Effect of fungicide, insecticides and plant populations on soybean diseases and yield.

Treatment	Initial population	Brown spot[a]	Total disease upper canopy[b]	Yield (bu/A)	Moisture (%)
Headline	80,000	2.5*	1.8	55.9	15.4
Headline	155,000	3.0*	0.3	56.1	15.2
Headline	225,000	1.6*	0.6	57.9	15.1
Headline + Mustang Max	80,000	2.0*	1.2	59.2*	15.4
Headline + Mustang Max	155,000	2.9*	1.4	62.2*	15.4
Headline + Mustang Max	225,000	1.9*	0.5	57.9	15.1
Quadris	80,000	4.2*	0.4	56.8	15.0
Quadris	155,000	4.7	2.0	56.9	14.9
Quadris	225,000	4.9	0.3	56.7	14.8
Quadris + Mustang Max	80,000	3.3*	0.3	59.4*	15.1
Quadris + Mustang Max	155,000	5.6	1.1	58.5*	14.8
Quadris + Mustang Max	225,000	5.0	1.2	58.7	14.8
None	80,000	9.1	0.8	51.8	14.8
None	155,000	9.2	1.2	55.5	14.9
None	225,000	7.1	0.9	57.7	14.9

[a]Disease was assessed on 10 leaves in the lower canopy.
[b]Disease was assessed on 10 leaves in the upper canopy. Diseases found in the upper canopy included Cercospora leaf blight, frogeye leaf spot, and downy mildew.
*Statistically different (P = 0.05) from the non-treated equivalent.